THIS PAGE BLANK (USPTO)

AU 99/946

4

**Patent Office
Canberra**

09/830727

I, KAY WARD, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PP 6863 for a patent by DONALD G. RICHARDSON filed on 30 October 1998.

WITNESS my hand this
Fifteenth day of December 1999

KAY WARD
TEAM LEADER EXAMINATION
SUPPORT AND SALES

**PRIORITY
DOCUMENT**
SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH RULE 17.1(a) OR (b)

THIS PAGE BLANK (USPTO)

AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION

FOR THE INVENTION ENTITLED:

"A METHOD OF RECORDING THE TEMPERATURE OF PERISHABLE
PRODUCTS IN COLD CHAIN DISTRIBUTION"

The invention is disclosed in the following statement:

TECHNICAL FIELD

The present invention relates to an information technology and telecommunications solution (IT&T) to the continuous monitoring and ready retrieval of time, temperature and other consignment data of perishables products, as they are transported between processor (consignor) and ultimate retailer sites (consignee), along what is referred to as the cold-chain.

BACKGROUND

There has been a significant trend to the use of more perishable, fresh (and frozen) foods, beverages and temperature sensitive pharmaceuticals, compared with the stable, processed or preserved substitute products. At the same time there is an increasing concern by consumers and governments to ensure the quality and safety of these temperature sensitive perishable products, is not jeopardised by hazardous handling prior to consumption. New temperature management tools are useful to minimise these handling hazards in domestic and international trade.

BACKGROUND ART

Various types of temperature measurement and recording equipment have been used in the past for this task and record of these are discussed below.

The family of portable reusable data loggers that are placed in perishable product consignments by the shipper to be retrieved and the stored temperature and time data downloaded by either linking to a programmed personal computer, or by removing a printed chart, have been in use by the food and pharmaceuticals industries for many years. These robust portable recorders are expensive and need to be returned to the shipper on

consignment completion. Additionally the data is not accessible until the logger is ultimately read and this maybe after a product recall or hold, should have been triggered. This means that the monitoring devise cannot be as widely used as safe product temperature management directs.

5   Refrigerated transportation vehicles and shipping containers used for perishable goods transfer have recording chart thermometers for recording the temperature of the interior space. These charts are specific for each vehicle in the cold chain and do not capture the product consignment temperature and time as the product moves between vehicles in the supply chain. It is therefore difficult to marry the charts with specific

10   consignments on other than a post-mortem basis which is not as responsive as industry shippers would like, in terms of being able to anticipate and respond to potential temperature abuse hazards during distribution.

The cumulative time and temperature effect is also indicated by a product, Monitor Mark[tm]. These time/temperature integrators are monitoring tools that provide a visual,

15   non-reversible, indication of time and temperature exposure above a pre-set threshold temperature. This is accompanied by the appearance and migration of a blue colour, left to right through a series of viewing windows on a rectangular flat laminate containing layers of paper film, adhesive and other active chemical components. These strips are 96mm by 20mm and while relatively inexpensive, only indicate, as distinct from measure, product

20   exhibiting time temperature abuse sensitivity and represent a signal as to when product quality should be checked prior to use.

The temperature, time and location state of air-freight consignments of perishable products are also recorded in a specially designed aluminium 'Envirotainer'. This is a returnable unit, typically owned by the airline, and is a capital expensive solution to the problem of temperature management for just a part of the cold chain.

DISCLOSURE OF THE INVENTION

The present invention seeks to provide all the advantages of the above systems together with the advantages of being able to economically continuously monitor and record the temperature, time and location of the perishable consignment from the production point to the retail outlet, together with having in-built alerts to flag consignment temperature abuse from a specified condition or a potential spoilage predictor, consistent with the reduction of distribution related, food safety and food quality risks.

The present invention provides, in one aspect, a small, adhesively backed, robustly designed, inexpensive and non-returnable, battery powered, temperature monitor and sender. This sender is fastened to pallet loads of perishable products that may require shipment between specified temperature ranges to ensure food safety risks are eliminated and food quality is maximised.

Preferably the sender is generating location and time data signals, together with the accurate temperature signals, and these signals are telecommunicated to a central database operated on behalf of numerous perishables fright originators. Such telecommunication of simple data signals is via appropriate technologies depending on specifics of location tracking discrimination and global location but normally would be via global systems for

mobile phone (gsm) together with triangulation for reasonable location precision and, via satellites for global positioning system (gps), for more precise location data and certain specific country applications.

Preferably the signals sent to the central database by the sender would be integrated with other consignment data. This other data would be sent directly and electronically to the database by the originator, such as dispatch date, time, product and manufacturing code, time/temperature tolerance ranges for abuse determination and recall alert, together with, page layout formats and company identification headers, for the ultimate report output printing or communicating, in terms of time/temperature/location plots, including geographic charts for visual tracking purposes.

Preferably the signals would be sent by senders attached to pallet loads of perishable products being transported both domestically and internationally, with likely transit times from overnight, to 20+days duration, in the case of refrigerated containerised shipments on international routes. Senders for different temperature and time ranges would have differing battery lives, designed temperature ranges and associated distinguishing marks to facilitate easy sender product selection and subsequent use.

Typically the signal functionality and pitch of the sender is kept to a minimum and the database infrastructure provides as much information as possible for overall data processing, to ensure that the manufactured cost and price of the disposable, mass produced senders, is low in relation to the profit potential of each pallet consigned. Low sender price will motivate high usage of the system, consistent with enhancing the safety

and quality of the cold chain in Australia and its export markets. Superior supply chain performance enhances overall competitiveness in global business.

Typically the central data-base is accessed by the consignor by internet communication, on a secure basis, by logging onto the system with a password via a

5   desktop, or laptop computer, in an office, or from the field; location and the specific details of every pallet consigned with a sensor, can then be viewed or printed out, via the consignor's home page. The regular interrogation of the system will confirm safe shipment progress or shipment completion, but will additionally flag any abused shipment and its location for earlier recall intervention if required.

10   Preferably the accuracy of the temperature data provided in hard copy form will be so calibrated and validated as to provide a legal foundation for consignor dialogue with receiving party and transporting parties and so facilitate dispute resolution between such parties, minimise the effect of the human frailties inherent in the current supply cold chain, and generally provide a tool for heightening awareness of the importance of the cold chain

15   management in providing safe, quality food and other perishables.

Typically pallet loads of perishable products (or smaller units than a pallet, such as a single shipping carton in the case of high value products like certain live or chilled seafood or pharmaceuticals) are transhipped from processor or originator by refrigerated truck, railcar, shipping container and ultimately by air-freight in certain cases, before

20   reaching destination. The telecommunication of the specific sender signal has therefore some barriers to ready transmission. For this reason the proposed sender will have a

limited capacity memory, to retain the signal stream until the transmission interruption ends and once again allows signal to be sent to the central data-base.

In the preferred embodiment of the invention the sender signal stream from a loaded truck, shipping container or aircraft would in the first instance be received by an on-board standard amplifier and relay, tuned to the system signal frequency to minimise ~~such interference, and then telecommunicated to the central database for real-time~~ integration of the perishable shipment's temperature and location status with the other company specific data.

Other embodiments of the invention may see only part of the sender system capability being used at times, for instance as an intelligent consignment tag, where location data is important but temperature ignored, as in dry goods distribution; or, in instances where the temperature data and alert capability is important, but location data ignored, as in storage of frozen products in a coldstore, where a hotline message from the database could alert management that the coldstore had developed a fault during a period ~~when unattended, and that stored product temperatures were rising dangerously.~~

BRIEF DESCRIPTION OF DRAWINGS

The invention will be more fully understood from the following description of a preferred embodiment which is illustrated, by way of example only, in the accompanying drawings in which:

Figure 1 is a diagram of the FLOWCHART of the proposed information system network, depicting Sender (1), product (2), and temperature, location and other information flows (3).

Figure 2 is a diagram of the sender (1) in elevation and plan view.

Figure 3 is a diagram of the Consignor's Input Data Report format (14)

Figure 4 is a diagram of one type of Output status report printed from the central data-base, via the internet at the consignor's desktop computer, showing the

5   temperature and travel time history to the current location, in realtime (11).

MODES FOR CARRY OUT THE INVENTION.

The consignor warehouseman (7) of a perishable product (2) selects the correct

sender (1) for the specific duty (frozen, -18°c; chilled 4°c; other) (18) and attaches that

sender by peel back adhesive tab (16) to the pallet consignment at the optimum and

10   designated position. The sender is activated at the time of dispatch by pulling tag (17) that

irreversibly activates battery, and the sender specific data (4 & 14) is then entered into the

central database (5) by the warehouseman (7) (sender number, manufactures code for

product, customer, date, time, report format, other) (14) from his desktop computer, via

modem linkage to the central database (5). During consignment's movement along the

15   cold chain (8) the sender transmits its data stream (via amplifier/relay (9) as required) to

the central database (5) where it is integrated with the stored data (4) from warehouseman

(7) in the database (5) for retrieval by internet connection (10) by the consignor, at any

convenient time and from any convenient location (11) by the use of the consignor's

specific password at the time of logging onto the system. The sender (1) is removed from

20   the consignment at the end of the cold chain with the battery drained, and is responsibly

disposed of by consignee warehouse (12) staff, on the formal receipt of the perishable

product shipment.

The consignor now has an exact temperature record of the delivery of the shipment to a specific distribution warehouse, possibly on the other side of the continent, or into demanding export markets like Japan, for instance, after pallet/s has been transhipped a number of times from truck to railcar to plane to truck. The consignor knows the

5   temperature, location, identity of the shipment, and the ultimate customer warehouse ~~location, in real time, right up to delivery acceptance by the customer. Additionally the~~ consignor has an in-built integrator of time and temperature abuse, which could signal the need to recall (or hold) the particular pallet, due to some distribution failure and hence safety or quality concern.
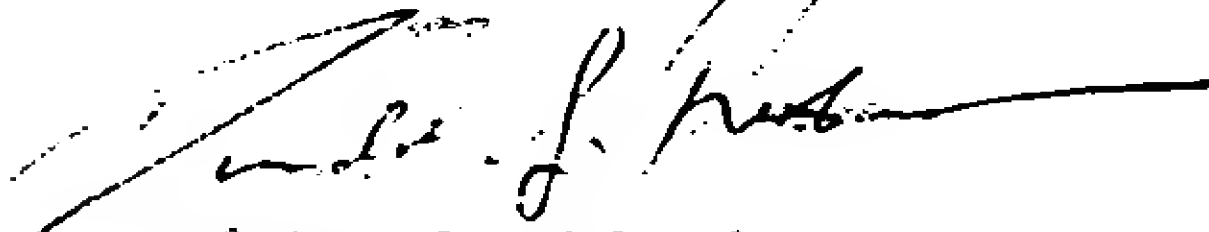
10   The use of this information systems approach to consignment temperature management along the cold chain indicates the shipper's responsible attitude to the superior delivery of its products and protects and enhances the consignor's corporate identity in the market place.

In the preferred operation of the system it is intended that responsible shippers of

15   perishable products adopting the system, would be able to negotiate more favourable insurance premiums for the in-transit protection of their product so adding to the overall cost benefit of the adopted temperature management system. Additionally the consignor can easily maintain electronic records of past shipments for ready retrieval, should later insurance or quality disputes arise. The past consignment data can be kept for as long as

20   the consignor deems necessary.

It will be apparent that further embodiments and exemplifications of the invention are possible without departing from the spirit or scope of the invention described.

Dated this Thirtieth day of October 1998
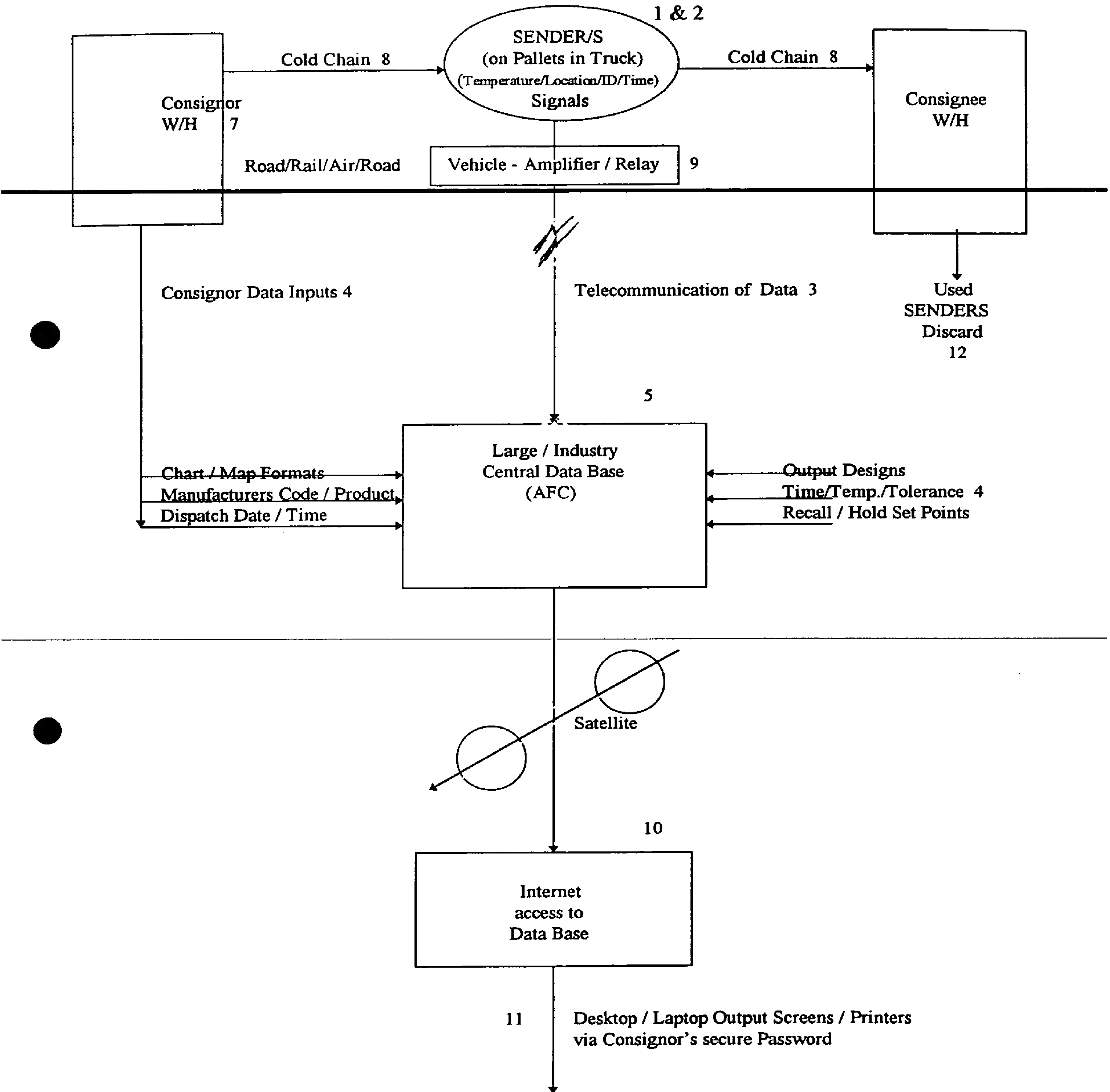
5

Donald G. Richardson

Figure 1

FLOWCHART

1 & 2

SENDER/S
(on Pallets in Truck)
(Temperature/Location/ID/Time)
Signals

Cold Chain 8

Cold Chain 8

Consignor
W/H   7

Consignee
W/H

Road/Rail/Air/Road

Vehicle - Amplifier / Relay   9

Consignor Data Inputs 4

Telecommunication of Data 3

Used
SENDERS
Discard
12

5

Chart / Map Formats
Manufacturers Code / Product
Dispatch Date / Time

Large / Industry
Central Data Base
(AFC)

Output Designs
Time/Temp./Tolerance 4
Recall / Hold Set Points

Satellite

10

Internet
access to
Data Base

11

Desktop / Laptop Output Screens / Printers
via Consignor's secure Password

Figure 2

SENDER DIAGRAM

1

| Elevation of Sender - Cover |
| Base Case |

Actuating Tear Strip
17

Peelback Adhesive Fixing   16

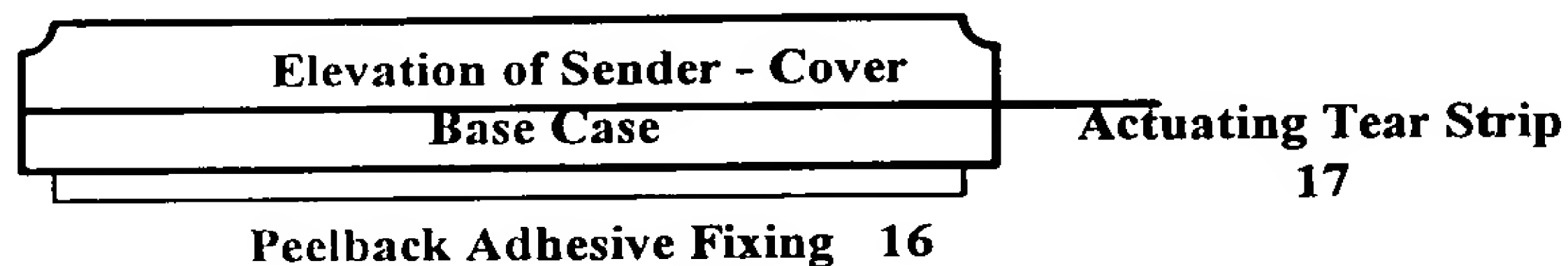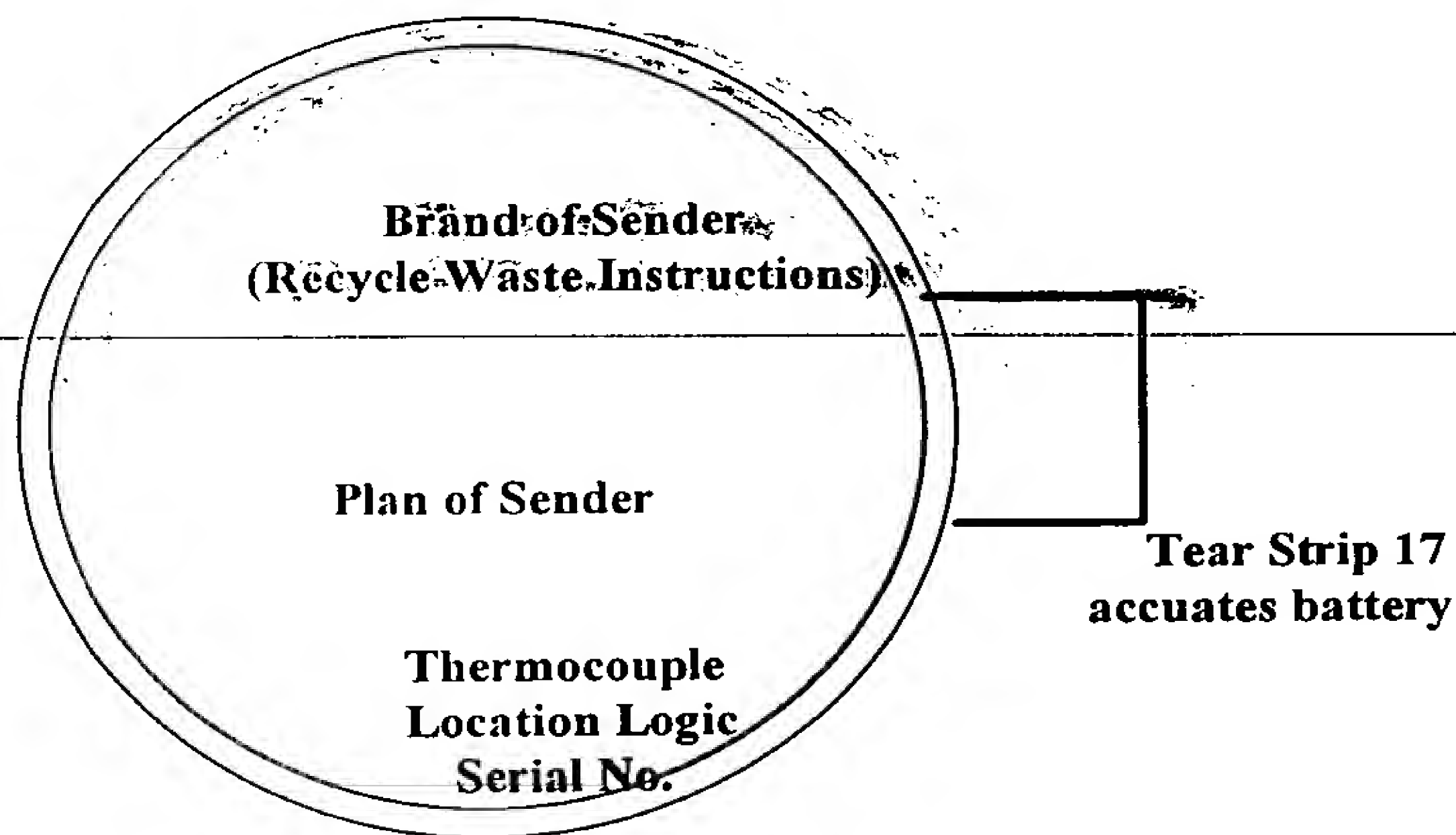**Plastic Case containing printed IC, Memory, Antennae, Battery for both sensing and limited signal transmission by telecommunication using gsm network**

Brand of Sender
(Recycle Waste Instructions)

Plan of Sender

Tear Strip 17
accuates battery

Thermocouple
Location Logic
Serial No.

Sender Case Colour distinguishes specific Sender duty: 18

Blue for Frozen Products - control around -18°C - short duration
Green for Chilled Products - control between 0°C and 6°C - short duration
Black for Frozen Products - control around -18°C - long duration
Red for Chilled Product - control between 0°C and 12°C - long duration

Figure 3

Consignor Password (secure ****)	**Consignor Input Data for XYZ System**			14
	(Keyed into computer at time of Loading)			
Consignment Attributes	Green	Blue	Black	Red
Sender Type / Colour				
Sender Serial Number (*** *** ***)		4		
Date / Time (yyyy/mm/dd/hh/mm)				
Expected Transit Time (dy/hr)				
Maximum Transit Temperature (oC)				
Pitch (Report signal interval in min.)				
Hotline Number (** ** **** ****)				
Alert 1 (red line) - Over Temperature (oC)				
Alert 2 (blue line) - Under Temperature (oC)				
Consignor Company Code				
Consignor Location Code				
Consignor Product Code				
Consignor Batch Identity Code				
Consignee Order Number				
Consignee Destination (Country/City)				

Sheet1 Chart 1

Figure 4.
CONSIGNMENT TEMPERATURE / TIME CHART

11

Page 1